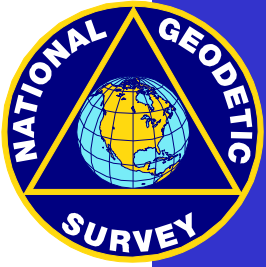


UNCLASSIFIED



# **Continuously Operating Reference Stations (National CORS)**

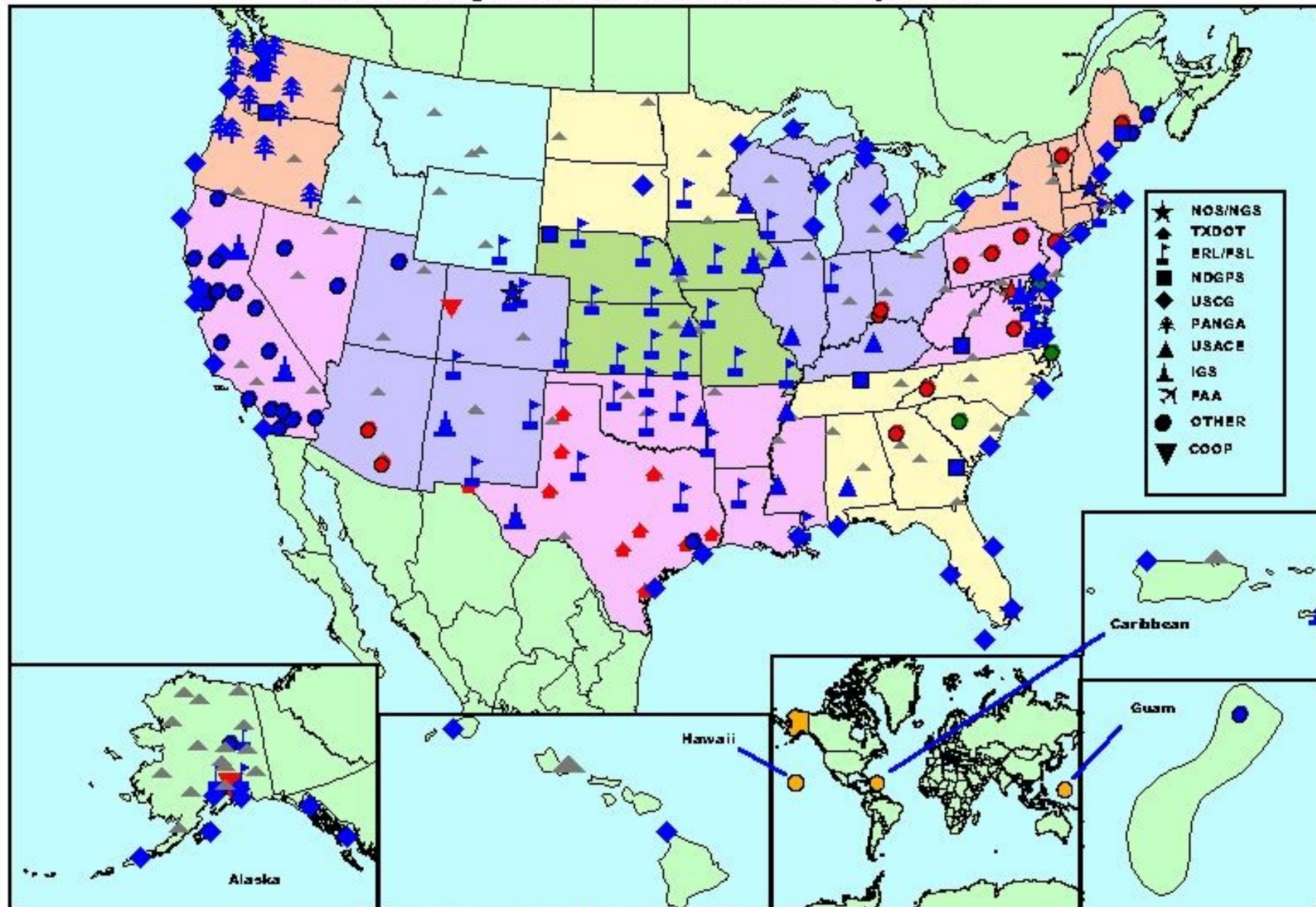
**David Minkel  
National Geodetic Survey  
(NOS, NOAA)**

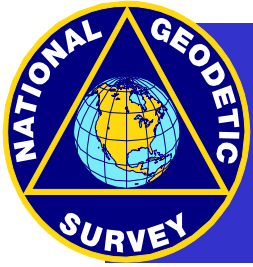


NATIONAL OCEAN  
SERVICE

UNCLASSIFIED

**UNCLASSIFIED**  
**CORS Coverage in the U.S. and Territories - April 2000**





# CORS PRODUCTS

## ▮ ▮▮RINEX Files

**GPS Observables (Pseudorange, Phase, Doppler)**

**Navigation File (broadcast ephemeris)**

## ▮ ▮▮ITRF97 Satellite Ephemerides

**Ultra-rapid [3 hrs; 20-75 cm]**

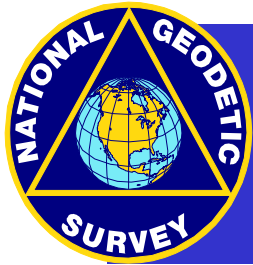
**Rapid [16 hrs; 9-11 cm]**

**Precise [4-7 days; 5-6 cm]**

## ▮ ▮▮Ionospheric Models

## ▮ ▮▮Antenna Calibrations





## OPUS - Online Processing User Service

### □ □□ Web-based GPS processing

**User submits RINEX data to NGS web page**

**NGS processes data and sends answer to user's email account**

### □ □□ OPUS uses CORS sites for data source

**Station position computed from 3 nearest CORS**

**Position has an RMS based on those three vectors**

### □ □□ Results

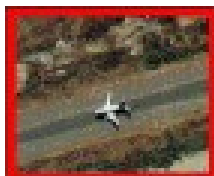
**3 hours of data with vector lengths of 172 km, 352 km, & 382 km; position misclosure was 4 centimeters**

### □ □□ Potential for “commercial” implementations

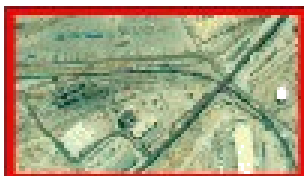


## Height Modernization Initiative

GPS Guided  
Aircraft Operations



GPS Subsidence  
Monitoring



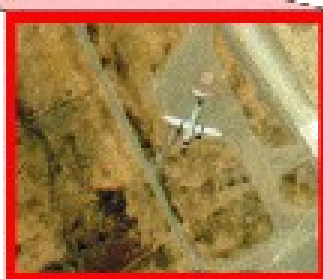
GPS Buoy  
Monitoring Water Levels



GPS Tie to  
Tidal Bench Marks



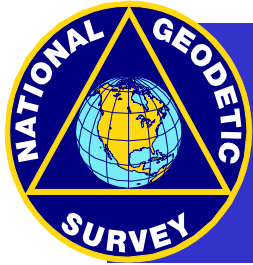
GPS Monitoring  
of Infrastructures



GPS Controlled  
Photogrammetry



GPS Positioning of Ship's  
Pitch, Roll and Squat



## Needs / ORD

### ▮ ▮▮ Threshold Requirements

**Precision Navigation 10 cm**

**Intelligent Vehicles 10 cm**

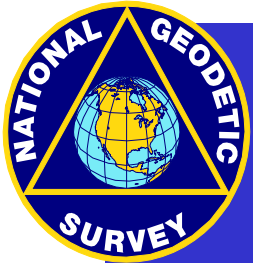
**Sediment Surveys 10 cm**

**Communications 1 nanosecond**

### ▮ ▮▮ Objective

**Standards Maintenance 1  
picosecond**





## SUMMARY

- ▮ ■■■ CORS is a data archival/dissemination system for GPS carrier phase & code range
- ▮ ■■■ Diverse applications and users
- ▮ ■■■ Post-processing (today)
- ▮ ■■■ Systems view and projections thru 2030    should consider real-time applications of    high-accuracy positioning/timing

